COVID-19 Precautions and Cancellations Still in Place

THE OBSERVER

The Newsletter of Central Valley Astronomers of Fresno September-October 2020

"He's got DNA!"

From the movie *E.T.-The Extraterrestrial* by Stephen Spielberg, 1981

Crew Dragon Returns Safely to Earth

On August 2, Space-X's Crew Dragon returned to Earth carrying two NASA astronauts, who spent 62 days aboard the International Space Station. The capsule came down in calm sunny waters in the Gulf of Mexico about forty miles offshore from Pensacola, Florida. The image above shows the spacecraft hitting the water as a Space-X recovery boat heads towards it. Both crew members, Douglass Hurley and Robert Beneken, were pleased with the performance of the spacecraft. Space-X and NASA engineers will evaluate the flight data, and if all goes well, the next Crew Dragon mission, this one carrying four astronauts for a six month stay aboard ISS, will be launched on October 23. A third six month operational mission, again with four astronauts, is scheduled for April 2021.

Image-Space-X/NASA

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The President's Report:

Greetings to all fellow astronomers! I hope you are all doing well and staying safe in these trying times. Between the heat, the smoke, the pandemic and the start of the academic year, it's hard to get any observing at all. That has not, however, stopped me from trying! From moon picture experiments through the smoke to a virtual planetary and lunar viewing for my junior high school, I've been busting out the scope more than I thought I would recently. I hope others have been able to do the same.

We had our second virtual meeting through Zoom on August 29th and it turned out to be very successful, with fifteen people participating. Scott Davis gave a very informative presentation on M1, the Crab Nebula. Our two Young Astronomer program students were active participants, as were a couple of new members. Unfortunately, the attempt to live stream the meeting to our Facebook page ran into technical problems, so we were not able to do it. We hope to have this issue fixed by the next general (and virtual) meeting on October 3. Hopefully also, with the next meeting, we can get an even better member turnout and get a good sized audience on the platform. The Facebook page has been getting a lot of traffic, especially since many people have been stuck at home, and it has been refreshing to interact with the public in some way.

Unfortunately, many of our Autumn activities, including the Dark Sky Festival and the Glacier Point star party, have been postponed or canceled due to the pandemic. Despite this, I hope many of you will manage to get out and do some socially distant observing once these smoky conditions improve. I know I will make an attempt!

-Ryan Ledak

Visit the CVA website for the latest information on CVA activities during the COVID-19 Pandemic

Number of exoplanets found as of August 2020- 4,326

How many more are out there?

Tens of thousands? Hundreds of thousands?

Profiles in Astronomy

Margaret Burbridge 1919-2020

Margaret Burbridge, born Eleanor Margaret Peachley, was raised in Davenport, England, and educated at University College London. In the late 1940s, after marrying the astrophysicist Geoffery Burbridge, she and her husband came to the United States, where she worked at the Yerkes Observatory. In the 1950s, Geoffery was on the staff at the Mount Wilson Observatory while Margaret held a position at Caltech. In 1962, Margaret moved to the University of California at San Diego. In 1972, while keeping her position at UCSD, she also assumed the directorship of the Royal Greenwich Observatory, but left it in 1974. She remained at UCSD as the director of the Center for Astronomy and Space Sciences until her retirement but continued to do active research into her 90s as a professor emeriti. She became a U.S. citizen in 1977. Geoffery died in 2010, and Margaret died from injuries as a result of a fall on April 5, 2020, eight months past her 100th birthday.

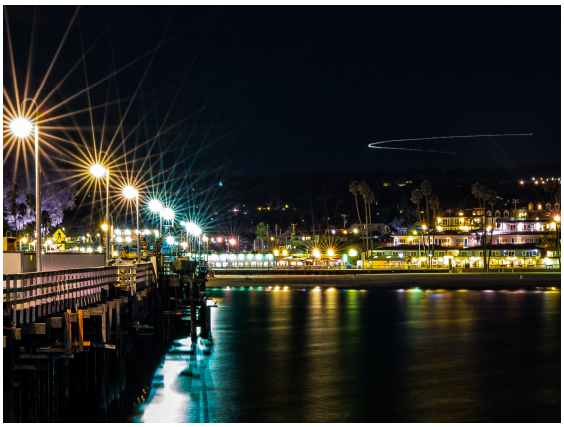
During her long career, Margaret Burbridge excelled in many areas. In the 1950s, she and Geoffery, along with William Fowler of Caltech and Fred Hoyle of Cambridge University, worked out how elements are produced in stars, known as stellar nucleosynthesis(Fowler later won the Nobel Prize for his role, and often questioned why Margaret did not also receive a Nobel award for her contributions to the effort). In the 1960s, she became a leader in quasar research and at one point found the then most distant quasar. In the 1980s, she led the team that built the faint object spectrograph for the Hubble Space Telescope and used it to discover that a black hole is at the center of galaxy M82. This led to searches for black holes in other galaxies and the idea that most have them at their centers.

Burbridge won many honors for her research, including The Bruce Medal of the Astronomical Society of the Pacific, the Gold Medal of the Royal Astronomical Society, the Albert Einstein Science Award, and the U.S.'s National Medal of Science. She was the head of many organizations, among them the American Astronomical Society and the American Association for the Advancement of Science. She was also a member of the prestigious Royal Society and the National Academy of Sciences. The asteroid 5490 Burbridge is named for her and the American Physical Society gives an annual Margaret Burbridge Award.

Two images by CVA member Alex Aretakis

Left-The Milky Way over Shaver Lake

Right-a meteor breaking up over Santa Cruz



Star Stories

Alioth

Alioth, also known as Epsilon Ursae Majoris, is actually the brightest star in the Big Dipper, with an apparent magnitude of 1.76. Due to a cataloguing error in the 1600s, it was given the designation of epsilon, the fifth brightest star in the constellation(see article below). It is classified as an A1 star, is about 81 light years from Earth, with an absolute magnitude of -.2. Its diameter is about four times that of the Sun, and its mass is just under three times the Sun's. It is one of the five stars in the Big Dipper that scientists believe came from the same gas cloud, are the same type, have roughly the same distance from Earth, and also have the same proper motion.

Alioth is widely believed to a spectroscopic binary, with at least one companion star and possibly two. But both are so faint that they have not yet been visually imaged. Scientists speculate that they are small M type stars. Other scientists, though, think that Alioth's rotational irregularities are due to a very small substellar object, possibly an exoplanet, although that has not yet been confirmed as well.

Like many other star names, Alioth comes from Arabic, a phrase *alyat al-hamal,* meaning "the sheep's fat tail." Arab astronomers thought that the Big Dipper more resembled a sheep than a bear and gave the star that name accordingly. The ancient Indians named the star *Angiras*, one of the Seven Rishis, or wise men in Hindu mythology, each of whom has a star in the Big Dipper.

The Misclassification of the Big Dipper

The Big Dipper forms one of the best known asterisms in the nighttime sky; the seven stars that make it up are among the most prominent in the heavens. However, in terms of classification, they are completely mixed up. Dubhe, designated the alpha, or brightest, star, is actually the second brightest, and Alioth, which is actually the brightest, is the epsilon, or fifth brightest. As such, the other stars are mislabeled as well. This occurred for several reasons. When Johann Bayer created his now famous star catalogue in 1603, designating stars by Greek letters based on their apparent brightness, brightness intensity could not be exactly measured, so many stars were mislabeled. Also, Bayer lumped stars together according to their magnitudes; i.e., all the magnitude one stars were put in one group, all the magnitude stars in another, and so on, without separating them by individual brightness. To compound the confusion, Bayer sometimes arbitrarily labeled stars according to their location in the constellation. The result was a number of stars that were misclassified relative to others. Bayer's system, for better or worse, has survived, and most star charts still use it today. Here, then, is a listing of the stars in the Big Dipper as they are, and another listing as they *should* be.

As they are:

Order	Star	Magnitude
Alpha	Dubhe	1.8
Beta	Merak	2.4
Gamma	Phad	2.4
Delta	Megrez	3.3
Epsilon	Alioth	1.7
Zeta	Mizar	2.1
Eta	Alkaid	1.9

As they should be:

Order	Star	Magnitude
Alpha	Alioth	1.7
Beta	Dubhe	1.8
Gamma	Alkaid	1.9
Delta	Mizar	2.1
Epsilon	Merak	2.4
Zeta	Phad	2.4
Eta	Megrez	3.3

What's New in Space

China Moves Forward with its Space Program

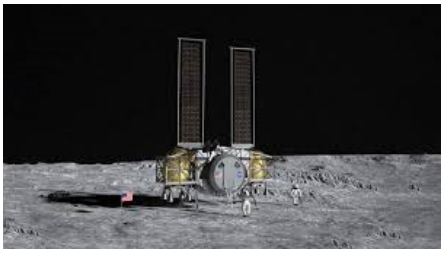
On Tuesday, May 5, China launched its new heavy lift rocket, the Long March 5, carrying its next generation prototype space capsule . The mission, which lasted almost three days, was a complete success, according to Chinese announcements. Western space officials had long speculated that China was working on a new advanced manned spacecraft to take the place of its original Shenzhou craft, one that may take Chinese astronauts to the Moon by the end of the decade. Images of it indicate that it looks very much like Boeing's Starliner spacecraft.

China also released images of its proposed permanent space station on May 27. It is a modular station that looks similar to the Russian Mir space station of the 1980s and 90s. China did not say when in-space construction of the station, which has been named Tiangong-3, or "Heavenly Palace," will begin, but the launch of the first module may come as early as March 2021. It is believed that the space station will hold up to five crewmembers at a time for stays up to a year. All of this activity indicates that China may resume manned space launchings soon. It has not launched a manned spacecraft since June of 2016

NASA also Pushes Ahead with Moon Plans

On May 3, NASA named three companies to build the lunar lander for the Artemis Program, which aims to land Americans on the Moon by the end of 2024. The biggest news abut the announcement, though, was that Boeing was not one of the three. Instead, NASA gave development contracts to Space-X, Blue Origin, and Dynetics. NASA gave no reason for excluding Boeing from the competition, but indications are that the space agency has become disillusioned with Boeing over two major spacecraft: the giant SLS moon rocket is almost four years behind schedule and several billion dollars over budget, and the commercial Starliner manned spacecraft is as well three years behind schedule, and because of repeated problems and delays, may not fly again until late 2020. Many now feel that Space-X has pretty much wrapped up the commercial crew contract to fly NASA astronauts on its Crew Dragon to and from ISS for the next several years.

Each of the three will propose lunar landers, and each has already revealed general outlines of their approaches. Blue Origin's is an outgrowth of its Blue Moon lander. Space-X is proposing a modified version of its huge Starship spacecraft; and Dynetics, of Huntsville, Alabama, is working on an integrated lander that can be launched aboard any rocket. Indications are that NASA will choose one of the three in 2022, and insist that it be ready for operational flight by the projected time of the first moon landing in late 2024.



Left-Blue Origin's Blue Moon lander Center-Space-X's lunar Starship Right-Dynetics' lunar lander

NASA, Space-X, and the Future of American Spaceflight

Elon Musk is on top of the world right now. Ten years ago, he was told that his company, Space Adventures, or Space-X for short, had next to no chance of beating Boeing and the other aerospace behemoths for lucrative NASA contracts, first to ferry cargo to ISS, then to build and launch a spacecraft that could carry NASA astronauts to the space station. Boeing was anointed as the clear winner. Now, in 2020, while Boeing is floundering, Musk has shocked the aerospace world by not only putting Crew Dragon 2 into space first, but also by having two NASA astronauts successfully fly it to ISS and return safely. And he'll do it again in about a month, this time with four NASA crew members.

How did Space-X do it? It put together a group of young enthusiastic engineers and scientists, let them take risks and try new and different ideas in an atmosphere where "it can't be done" was heresy, and let them go. First, they designed and built the Falcon reusable rocket, then the Dragon cargo spacecraft, then the Falcon Heavy(more about that in a few minutes), then the Crew Dragon, and then the Starship. Money helped, of course, and Musk, with his billions from Tesla and PayPal, could afford it. But the main part was Space-X's commitment to get the job done, and it has. Space-X will now probably win the commercial crew contract to send NASA astronauts to and from ISS for the next several years. Boeing's Starliner will eventually fly and will find paying customers in the private sector, but, stuck in the 1960s and 70s, it's lost its chance at cosmic glory. Space-X will be the company to lead the way for the USA in space.

The fact that Space-X was one of three companies chosen by NASA to design and build the lunar lander for the Artemis Program also shows its technological leadership. This, though may be under challenge, depending on what happens in the November elections. Congressional Democrats have made it pretty clear that they do not like NASA having private industry design and build the lunar landers, and Republicans are saying that NASA should use the Orion and SLS simply because they benefit their home states(there are rumors that NASA may use not only the Heavy Falcon but also the Crew Dragon for the initial Moon missions because the SLS is so far behind schedule-see below). If the Democrats come to power in November, they may cancel the Artemis Program and demand that NASA start all over with government-designed and built orbiters and landers and other lunar equipment. This will, of course, set back American moon landings by at least three to five years, in the same way the Barrack Obama cancelled the Constellation Program in 2010. They also have qualms about landing Americans on Mars by 2034. In fact, speculation is that if the Democrats win the 2020 elections, they may revamp the entire manned space program, downscaling the Moon program and possibly ending the Mars program altogether.

Now that the commercial crew vehicle competition is pretty much over, the next major goal is the Artemis moon landing program. NASA's plan was originally to have the Orion-MPCV and the SLS rocket make an unmanned circumlunar flight by the end of this year, a crewed lunar orbing mission in 2022, and the first moon landing in 2024. However, the SLS is almost four years behind schedule; Boeing insists that it will be ready for launch by the middle of next year, but NASA has doubts. It is now looking into the possibility of using two of Space-X's Heavy Falcon, one to launch the Orion-MPCV and its service module, and the second to put the lunar insertion module into Earth orbit. The two would link up, the and the lunar rocket

would send the combined craft to the moon. If started now, this could be done by the summer of 2021. NASA wants a successful unmanned mission by the end of 2021, when it will start selecting and training crews for the second and third Artemis flights; some are now saying that the 2024 deadline for putting Americans back on the Moon is unattainable, but NASA is still aiming for that date. The 2022 flight will consist of four people, at least one of them a woman and probably one an ESA astronaut as well. This is because the European Space Agency designed and built the Orion-MPCV service module and is also providing financial and technical support. The 2024 crew that will land on the moon will also have four crew members, again, including at least one woman, and possibly also an ESA astronaut or Russian cosmonaut. They will take the lunar lander to the surface, leaving the Orion-MPCV unmanned in lunar orbit. By 2025, NASA's Gateway space station will be under construction in lunar orbit, and all subsequent lunar landing missions will first stop at it, then take a lunar "taxi" to the surface before returning to the station and Earth.

So, that's the future of American spaceflight, or at least the projections. But as the Robert Burns poem goes, "The best laid plans of mice and men…" Let's hope they all go through.

A Visitor to Small Planet-Comet NEOWISE-the Highlight of the Summer of 2020 (and we certainly needed something otherworldly and awe inspiring in 2020)

Right-Two images by CVA Member Kane Sjoberg

Left-Image taken by CVA president Ryan Ledak at Courtright Reservoir

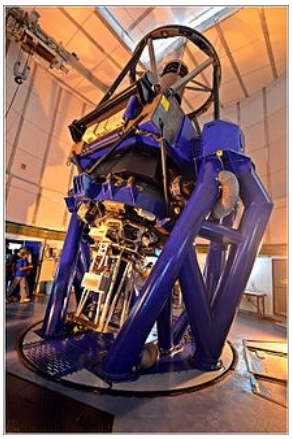
Right-Image taken by CVA member Larry Parmeter at Big Stump

Another in a continuing series on lesser known-but still important-observatories throughout the world

The Girawali Observatory

The Girawali Observatory is sponsored and managed by the Inter-University Centre for Astronomy and Astrophysics(known as IUCAA) in Pune, India. It is used by a number of colleges and universities in India to further astronomical and related studies. It is located in Girawali, Maharashtra state, India.

In the early 2000s, the IUCAA felt a need for a large telescope to be used by several universities, and applied for a grant from the University Grants Commission, which in turn received support and funding from the Particle Physics and Astronomy Research Council(PPARC) in England. PPARC also arranged for a telescope to be designed and built in England for the observatory. The telescope, a 2m Cassegrain, was finished in early 2006, and dedicated on May 13, 2006, and has been used regularly since then.



The observatory has only one telescope but is used for a number of different observing projects. It can be fitted with a faint object spectrograph, a high resolution photometer, and any one of several CCD cameras. The observatory's main focus is on stellar studies, but it has also done research into galaxies, quasars, black holes, and cosmic rays.

From *The Observer* Archives

Off and on during the 1980s, *The Observer* carried a column entitled "Mindbenders." This is one of the Mindbender puzzles from the October 1983 issue. The answer, from the November 1983 issue, will be given in the November-December 2020 issue.

"A long-time friend of yours, after much hesitation, reveals to you that she is actually an extraterrestrial being. You are surprised and somewhat skeptical. She agrees to give you some fingernail clippings for testing in a well-equipped biochemical laboratory. Your preliminary tests show that the clipping seem to contain a combination of DNA and amino acids normally found in human fingernails. You are beginning to doubt your friend's sanity. Then you conduct a straightforward experiment with the clippings that conclusively shows your friend is from another world. What measurement did you perform? Why is this experiment definitive?"
(A hint-This puzzle is not exactly for the average person. You really need to know something about genetics to solve it.)

Astronomy Stuff for Sale

1. Baader Hyperian Mark III Zoom eyepiece 8-24mm. Complete with original box, storage pouch, 1 ¼ and 2 inch nose. Used about half a dozen times $200

2. Celestron vibration suppression pads with original box $25

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